

**CLAIMS**

1. A method for generating one or more images, comprising:  
collecting data samples representative of a motion of an object;  
acquiring image data of at least a part of the object over a time interval;  
5 synchronizing the data samples and the image data to a common time base; and  
generating one or more images based on the synchronized image data.
2. The method of claim 1, wherein the collecting comprises performing a computed  
tomography procedure, an MRI procedure, or a PET procedure.
- 10 3. The method of claim 1, wherein the time interval comprises at least one  
physiological cyclic interval.
4. The method of claim 3, wherein the at least one physiological cyclic interval  
15 comprises one interval within a physiological breathing cycle.
5. The method of claim 1, wherein the generating comprises constructing a volumetric  
image.
- 20 6. The method of claim 1, wherein the generating comprises constructing a plurality of  
volumetric images.

7. The method of claim 6, wherein the plurality of volumetric images are displayed in sequence to form a video.

8. The method of claim 1, wherein the generating the one or more images is performed  
5 retrospectively.

9. The method of claim 1, further comprising identifying an interval of interest, wherein the generating the one or more images comprises constructing an image using image data associated with the interval of interest.

10

10. The method of claim 1, wherein the generating comprises using image data that are associated with a phase of the motion to generate an image.

11. The method of claim 1, wherein the generating comprises using image data that are  
15 associated with a first phase of the motion to generate a first image, and using image data that are associated with a second phase of the motion to generate a second image.

12. The method of claim 11, further comprising displaying the first and the second images in a sequence to form a video.

20

13. The method of claim 1, wherein the object comprises at least a portion of a patient.

14. The method of claim 1, wherein the object comprises at least a portion of a structure that is undergoing stress testing.

15. A system for generating one or more images, comprising:

- 5 means for collecting data samples representative of a motion of an object;  
means for acquiring image data of at least a part of the object over a time interval;  
means for synchronizing the data samples and the image data to a common time  
base; and  
means for generating one or more images based on the synchronized image data.

10

16. The system of claim 15, wherein the means for generating is configured to construct an image using image data associated with an interval of interest.

17. The system of claim 15, wherein the means for generating is configured to generate  
15 an image using image data that are associated with a phase of the motion.

18. The system of claim 15, wherein the means for generating is configured to generate a first image using image data that are associated with a first phase of the motion, and a second image using image data that are associated with a second phase of the motion.

20

19. The system of claim 18, further comprising means for displaying the first and the second images in a sequence to form a video.

20. The system of claim 15, wherein the means for collecting comprises an optical device and a marker block.

5 21. The system of claim 15, wherein the means for acquiring is selected from the group consisting of a CT machine, a MRI machine, and a PET machine.

22. The system of claim 15, wherein the means for synchronizing and the means for generating comprises a processor.

10

23. A computer product having a set of stored instruction, the execution of which causes a process to be performed, the process comprising:

collecting data samples representative of a motion of an object;

acquiring image data of at least a part of the object over a time interval;

15 synchronizing the data samples and the image data to a common time base; and

generating one or more images based on the synchronized image data.

24. The computer product of claim 23, wherein the generating comprises constructing a volumetric image.

20

25. The computer product of claim 23, wherein the generating comprises constructing a plurality of volumetric images.

26. The computer product of claim 25, wherein the plurality of volumetric images are displayed in sequence to form a video.

5 27. The computer product of claim 23, wherein the generating comprises using image data that are associated with a phase of the motion to generate an image.

28. The computer product of claim 23, wherein the generating comprises using image data that are associated with a first phase of the motion to generate a first image, and using  
10 image data that are associated with a second phase of the motion to generate a second image.

29. The computer product of claim 28, further comprising displaying the first and the second images in a sequence to form a video.

15 30. A method for generating one or more images, comprising:  
acquiring image data of at least a part of an object over a time interval;  
associating the image data with one or more phases of a motion cycle; and  
constructing one or more images using the image data that are associated with the  
respective one or more phases.

20

31. The method of claim 30, wherein the image data is associated with a plurality of phases of a motion cycle, and a plurality of images are constructed.

32. The method of claim 31, further comprising displaying the plurality of constructed images in a sequence to form a video.

5 33. A method of gating an application of radiation, comprising:  
measuring a first set of signal data representative of a physiological movement of a patient during a first time period;  
comparing the first set of signal data with a second set of signal data related to measured physiological movement of a patient during a second time period to identify  
10 degree of deviation from periodicity of the physiological movement; and  
gating radiation to the patient if the degree of deviation from periodicity exceeds a threshold based upon results of the pattern matching.

34. The method of claim 33, wherein the first set of signal data and the second set of  
15 signal data are compared using an autocorrelation function.

35. The method of claim 33, wherein the first set of signal data and the second set of signal data are compared using an absolute difference function.

20 36. The method of claim 33, further comprising determining a degree of match between the first set of signal data and the second set of signal data.

37. The method of claim 36, wherein the degree of match is determined by a secondary peak value of an autocorrelation function.

38. The method of claim 36, wherein the degree of match is determined by a secondary  
5 minimum value of an absolute difference function.

39. The method of claim 36, further comprising comparing the degree of match to a threshold range.

10 40. The method of claim 33, further comprising predicting a period of the physiological movement during a third time period.

41. The method of claim 40, further comprising predictively actuating a gating system component based upon the predicted period.

15

42. The method of claim 33, wherein the second set of signal data comprises a data model of the physiological movement of the patient.

43. The method of claim 33, wherein the comparing comprises performing pattern  
20 matching the first set of signal data with the second set of signal data.

44. A method of gating an application of radiation for a CT procedure, comprising:

obtaining signal data representative of at least a portion of a physiological movement  
to form a set of ordered measurement samples;

comparing the set of ordered measurement samples against prior measurement  
samples of the physiological movement to determine deviation from periodicity of the set of  
5 ordered measurement samples; and

gating CT radiation to the patient if the deviation from periodicity is outside a  
threshold range.

45. The method of claim 44, wherein the physiological movement comprises breathing  
10 movement.

46. The method of claim 44, wherein the physiological movement comprises cardiac  
movement.

15 47. The method of claim 44, wherein the comparing comprises pattern matching the set  
of ordered measurement samples against the prior measurement samples of the physiological  
movement.

48. The method of claim 47, wherein the pattern matching is performed using an  
20 autocorrelation function.



49. The method of claim 47, wherein the pattern matching is performed using an absolute difference function.